



## DIVERSITY OF TERMITES IN THE PAMPLEMOUSSES BOTANICAL GARDEN, MAURITIUS

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### ABSTRACT

The Pamplemousses Botanical Garden, in Mauritius, is globally recognized for its floristic biodiversity, housing >8000 trees. However, this historic plant heritage is under constant pressure due to termite infestations. This study first sought to inventory the species of termites present, then to compare them to the results of previous studies. The study conducted in 2019 and 2022 identifies seven species *Procryptotermes falcifer* (Krishna), *Postelectrotermes howa* (Wasmann), *Coptotermes gestroi* (Wasmann), *Prorhinotermes canalifrons* (Sjöstedt), *Nasutitermes voeltzkowi* (Moutia), *Cryptotermes pallidus* (Rambur). A new record of the Rhinotermitidae viz., *Heterotermes malabaricus* (Snyder) from Mauritian territory is documented.

**Key words:** *Heterotermes malabaricus*, termites, Rhinotermitidae, Kalotermitidae, Termitidae, invasives species, Mauritius Island, Botanical Garden, social insects, inventory, genus, species, new record

The entomological biodiversity of tropical regions remains largely unknown, mainly due to the limited number of researchers specialized in this geographical area and the limited resources. In Mauritius, the first inventory of termites (Moutia et al., 1946) made it possible to identify ten species, including *N. voeltzkowi* (Moutia A., 1936), *C. pallidus* (Rambur), *C. havilandi* (Sjöstedt Y), *P. howa* (Wasmann), *H. philippinensis* (Light), *P. canalifrons* (Sjöstedt), *C. havilandi* (Wasmann), *P. falcifer* (Krishna), *Cryptotermes sp.* (Banks) and *T. mauricianus* (Rambur). Bordereau et al. (1999) identified eight species, including an additional subterranean termite *C. intermedius* (Silvestri). The drywood termite species *C. havilandi* (Sjöstedt) was not included. The present study is restricted to the Pamplemousses Botanical Garden Mauritius

### MATERIALS AND METHODS

Sampling was carried out at the Sir Seewoosagur Ramgoolam Botanical Garden in Pamplemousses, created in 1770 on the initiative of the French botanist Pierre Poivre. This garden, located in the north of Mauritius (20°6'16"S/ 57°34'49"E), covers 33.2 ha and is home to 759 species, including 8,668 trees and a large collection of palm trees (Dankowska et al., 2005). It is the oldest tropical botanical garden in the world (François, 1936). Spot sampling points were distributed over three areas, A (20°6'19"S/ 57°35'03"E), D (20°6'27"S/ 57°35'00"E), and R (20°6'33"S/ 57°34'55"E), with a total of 91 sites. First sampling is in November 2019, followed by the second

in May 2022. For each colony observed, attention was focused on soldiers and alates. The 252 termite samples collected were preserved in 90% ethanol as recommended by (Jones and Eggleton, 2000). A large majority of these samples were identified as belonging to arboreal termites, and for family morphotypes belong to the soldier-based determination key by Myles (2005) was used. Grassé (1985), Krishna (1961) and Cachan (1951) were used to determine the genus. A comparison with the termite collection of the observatory was carried out to confirm the identification. However, no subterranean termite samples collected could be identified by us. Therefore, this sample was identified by DNA sequencing.

### RESULTS AND DISCUSSION

This study revealed a new invasive species, *H. malabaricus* (Snyder, 1933). *P. falcifer* (Krishna K., 1962), a drywood termite of the *Kalotermitidae* family, is endemic to Mauritius and Réunion (Peppuy and Bordereau, 1997). *Procryptotermes* soldier can be distinguished from most other *Kalotermitidae* by its long, sickle-shaped mandibles (Krishna K., 1961). The colonies, which are not very dense, number only a few hundred individuals. This species likely plays a role in decomposing abundant dead plant matter in the garden. This termite is particularly abundant in the three study areas; *P. howa* (Wasmann, 1897), is a termite native to Madagascar and forms populated colonies. All samples were collected from dead branches of fallen trees in wetlands. It seems to play a role ecologically important

in the recycling of organic matter; *C. gestroi* (Wasmann, 1896), a subterranean termite of the Rhinotermitidae family, is native to South Asia (Singapore, Malaysia, Indonesia, Philippines) (Neoh et al., 2023) and invasive in Reunion and Mauritius (Chouvenc et al., 2016). It forms underground colonies that can reach millions of individuals and all xylophagous. Considered the most harmful termite in Reunion, it belongs to the genus *Coptotermes*, (Scheffrahn et al., 2005). Despite its strong urban presence in Mauritius, it is rarely harvested in the garden, where it was found on a bottle palm *H. lagenicaulis* (Bailey) Moore (1976); *P. canalifrons* (Sjöstedt, 1904) is an underground termite belonging to the family Rhinotermitidae. This species considered as harmful to Reunion (internal data) and Madagascar (Cachan, 1950). The individuals were collected from fruit trees such as the mango *M. indica* (Linné, 1753) where some important colonies were observed. This termite is also present in Seychelles (Bordereau et al., 1999) and Mayotte (internal data); *N. voeltzkowi* (Moutia, 1936), an arboreal termite of the family Termitidae the most recent in the phylogenetic history (Chouvenc et al., 2021). Unlike other species, it only harbors bacteria in its digestive system. Essentially xylophagous, it builds nests on the branches of living trees. The soldier has a protuberance on the head which secretes an adhesive substance (Lefebvre, 2008). Like all *Nasutitermes*, it has a conical or pointed head, often called “cone head” (Tong et al., 2019). It is the most common species in the garden. It was harvested mainly from fruit trees such as *M. indica*; *C. pallidus* (Rambur, 1842) is a dry wood termite that has never

been harvested from homes and lumber on Mauritius and Reunion Island. The colonies are sometimes very populous (several thousand individuals). The soldiers have a reddish rectangular head (brown black on the inner edge), their total length is of the order of 4-5 mm. It was harvested from the dead parts of a fruit tree *L. chinensis* (Sonnerat, 1782). It is endemic to Reunion and Mauritius (Moutia et al., 1946); *H. malabaricus* (Snyder, 1933) is the species identified by genetic sequencing. It had never been recorded in the Pamplemousses garden, nor more generally in Mauritius. In addition, it is absent from the territory of Reunion. *Heterotermes* is a genus of subterranean termites belonging to the Rhinotermitidae Carrijo et al. (2020). These termites are considered invasive and devastating due to their relatively large colonies and rapid reproduction (Bourguignon et al., 2016). This species has been described in India as a wood destroyer (Rashmi et al., 2011). A specimen was collected from the trunk of a tree *Agathis robusta* (Bailey, 1883). Only one small colony was identified in the three study areas.

Ten species of termites were identified in 1946, compared to only eight in 1999 (Table 1); 2019 and 2022 censuses made it possible to find these same species, as well as an additional species *Heterotermes*, previously unidentified: *H. malabaricus* (Snyder, 1933). The Jardin de Pamplemousses alone is home to six previously recorded species viz. *C. havilandi* (Sjöstedt, 1900) and *Cryptotermes* sp. (Banks, 1918), drywood termites common in homes are however absent. In this small territory, five species of invasive termites (2 drywood

Table 1. Comparison of termite species inventories

1933 Inventory	1999 Inventory	2019 and 2022 Inventories
Territory of Mauritius	Territory of Mauritius	Pamplemousses Botanical Garden
<i>Termes mauricianus</i> *	-	-
<i>Nasutitermes voeltzkowi</i>	<i>Nasutitermes voeltzkowi</i>	<i>Nasutitermes voeltzkowi</i>
<i>Cryptotermes pallidus</i>	<i>Cryptotermes pallidus</i>	<i>Cryptotermes pallidus</i>
<i>Cryptotermes havilandi</i> **	-	-
<i>Neotermes (Postelectrotermes) howa</i>	<i>Postelectrotermes howa</i>	<i>Postelectrotermes howa</i>
<i>Heterotermes philippinensis</i> **	<i>Heterotermes philippinensis</i> **	-
-	-	<b><i>Heterotermes malabaricus</i>**</b>
<i>Prorhinotermes canalifrons</i>	<i>Prorhinotermes canalifrons</i>	<i>Prorhinotermes canalifrons</i>
<i>Coptotermes havilandi (gestroi)</i> **	<i>Coptotermes gestroi</i> **	<i>Coptotermes gestroi</i> **
<i>Procryptotermes sp (falcifer)</i>	<i>Procryptotermes falcifer</i>	<i>Procryptotermes falcifer</i>
<i>Cryptotermes sp (dudleyi)</i> **	-	-
-	<i>Coptotermes intermedius</i> **	-
10	8	7

\*probably disappeared species - \*\*invasives genus

and 3 subterranean) (Blumenfeld et al., 2020), Evans (2021), Kalleshwaraswamy (2023), and Duquesne et al. (2024). These additional data suggest the need to conduct more in-depth studies.

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#### AUTHOR CONTRIBUTION STATEMENT

FC and SB designed the research and conducted the experiments. FC analysed the data and wrote the manuscript. JDC managed the administrative part of the study. FC et SS revised the manuscript. All authors have read and approved the manuscript.

#### CONFLICT OF INTEREST

No conflict of interest.

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